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ABSTRACT

The purpose of this study is to determine if children who attend a bilingual math-science center will increase their level of performance to a greater degree than their counterparts on a test of problem solving and scientific thinking. The study tests 86 sixth-grade students in the Cutler Elementary School in the Cutler-Orosi Unified School District, California. The Sequential Test of Educational Progress (STEP): Science 4B, developed by the Educational Testing Service, was administered to the students. Results point out that the experimental group which attended the Center improved considerably more than the control group. The author concludes that a math-science center should be a basic part of every bilingual school. (RL)

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A BILINGUAL MATH-SCIENCE LEARNING CENTER

by

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A BILINGUAL MATH-SCIENCE LEARNING CENTER

The purpose of this study is to determine if children who attend a bilingual math-science center regularly will increase their level of performance to a greater degree than their counterparts on a test of problem-solving and scientific thinking.

Background

In the technological world we live in today we can no longer wait until high school or college to teach the children to think scientifically. The scientific process teaches the child, when confronted with a problem, to look at all the facts, then work towards the best solution of the problem. This applies to problems in science, in other subjects, or any problems the child will ever face. Suchman (1) says that science programs should aim at making pupils more independent, systematic, empirical, and inductive in their approach to problems of science.

We have the means of teaching the scientific process in our schools today. Piaget (2), Bruner (3), Gagne (4), and many others point out that children must have firsthand experience using the scientific method in inquiry and discovery in order to gain sufficient knowledge of the process to be able to use it to solve their own problems. Taba (5) has stated that "Learning by discovery may, then, be the chief mode for intellectual productivity and autonomy."

The Cutler School Math-Science Learning Center

The Center at Cutler School is a supplement to the school's regular science program, with units of inquiry, exploration, experimentation, games, and puzzles, in mathematics and science. The purpose of the Center is to give the children a chance to use the Scientific Method "firsthand" and to help them learn problem-solving skills.

Science Center

Malkin (6) has said, "If an elementary science program is to be successful, then the pupils must feel that they can succeed in science. It is important that activities be so chosen that they do not discourage children." Therefore, the Spanish-speaking bilingual children should be given the opportunity to operate in the language they feel most comfortable in. This necessitates a bilingual science center in an area where many of the children speak better Spanish than English.

The Center is located in the back half of an old house on the school grounds. It is set up with 12 small tables as problem stations. Each station has a different problem, experiment, or game. The children come on their own time before school, during lunch or after school. They may do any problem they wish, and the stations are changed each week, and new problems or experiments are set up.

Each station has a task card on which a problem is stated very simply in English and Spanish. If a child cannot read the task card, the problem is explained in either English or in Spanish.

Design of the Study

The subjects of this study were 86 sixth grade students in the Cutler Elementary School in the Cutler-Orosi Unified School District. As taken from their school records, the tested intelligence of the subjects ranged from 83 to 134, with 111 being the median. Approximately 85% of the students were of Mexican-American background.

The test used was the Sequential Test of Educational Progress (STEP): Science, Form 4B. This test was developed by Educational Testing Service who indicates that it measures ability to identify and define scientific problems, to suggest or eliminate hypothesis, to select procedures for testing hypothesis, to interpret data and draw conclusions, to evaluate statements by others, and to reason quantitatively and symbolically.

Science Center

All the sixth grade students at Cutler School were pre-tested with the odd-numbered questions of Form 4b either in English or in Spanish, whichever the student wanted to be tested in. Then 15 names were selected randomly, and those students attended the Center for one half hour every day for ten weeks. Then all the sixth graders were post-tested orally, as with the pre-test, but with the even-numbered questions of Form 4b. Aproximately 25% of those tested chose to be tested in Spanish. And of the randomly chosen experimental group, 33% had taken the test in Spanish.

The tests were then scored and the difference between the pre-test and the post-test scores of the experimental and control groups were compared.

Conclusion

It must be stated that though the experimental group did not improve significantly over the control group, they did improve considerably more than the control group. The small size of the experimental group made it extremely difficult to reach significance. Although there was no significant difference between the two groups when an F test was applied, there was a six point increase (from 14-20) in the median of the experimental group and no increase in the control group's median.

A conclusion of subjective significance relating to the affective domain is the fact that 25% of the students in the control group and 33% of those in the experimental group chose to be tested in Spanish.

It is the feeling of the author that there is a great need for the development of an instrument of evaluation which tests problem-solving ability without requiring previous knowledge of many scientific facts. The STEP tests require a certain amount of factual background which the students were not prepared for on the pre-test, and were not taught toward on the post test.

There were many changes in the behavior of the experimental group which the test did not evaluate. The students who attended the Center greatly improved in the areas of questioning, discussion, and the verbalization of their thoughts.

It is the author's feeling that a bilingual math-science center is a valuable addition to any school which serves bilingual children.

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